

Application No. 09/681,186
Amendment dated August 17, 2004
Reply to Office Action of February 17, 2004

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(b) REMARKS

Claims 1-15 are pending in this application. All Claims are rejected.

Claims 1 and 12 were rejected under 35 U.S.C. §103(a) over Thieme et al. (U.S. Patent 5,222,113) in view of Iketaki (U.S. Patent 5,450,463), Levine et al. (Tomographic reconstruction of an integrated circuit interconnect), and Sartore (U.S. Patent 5,703,361).. This rejection is respectfully traversed for the following reasons.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the reference (or references when combined) must teach or suggest all the claim limitations¹. With regard to some suggestion or motivation to modify the reference or to combine reference teachings, as well as to a reasonable expectation of success, it has been well articulated that a factual inquiry whether to combine references must be based on objective evidence of record² and that teachings of references can be combined only if there is some suggestion or incentive to do so³.

The invention claimed in independent Claim 1 is a method of examining structures of an integrated circuit on a semiconductor substrate with a passivation layer over the structures to investigate electromigration in the structures. Examination of the structures without the passivation layer would result in an incorrect interpretation of electromigration in the structures. Moreover, as described in paragraphs 50 and 51 of the specification and claimed in independent Claim 1, the change in contrast of the high-contrast X-ray image is used to observe changes in the distribution of the material of which the structures are made.

None of the publications cited by the Patent Office discloses or suggests using X-rays to examine the structures with a passivation layer in accordance with independent Claim 1 using transmission of the X-radiation through the substrate.

¹ MPEP 2142-2143

² MPEP 2143.01 and *In re Lee*, 277 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002).

³ *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988).

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Similarly, none of the publications suggests examining the structures and observing electromigration in the passivated structures on the semiconductor substrate by observing the changes in the contrast of the high contrast X-ray image in accordance with the method claimed in independent Claim 1.

More specifically, Applicants respectfully assert that the Iketaki patent is not even relevant to the claimed invention and cannot teach or suggest the claimed invention in any way. Iketaki relates to obtaining an X-ray image of a biological specimen. X-ray imaging of biological specimens has its own specific requirements due to the nature of the specimens and the danger of destroying biological matter, and it has nothing to do with imaging of integrated circuits on semiconductor wafers at harsher, shorter X-ray wavelengths. Because of the damage caused by short-wave X-rays to a biological specimen, the microscope in Iketaki uses softer X-rays between with the wavelength between 6.5 nm and 4.37 nm (Col. 9, last line). Also, Iketaki actually teaches away from the system used to practice the method of the present invention, saying that using "the X-ray optical elements such as zone plate and..." is "of little practical value" (Col. 2, lines 60-65). Therefore, no suggestion or motivation to combine Iketaki with Thieme or any other publication cited by the Patent Office could be found. Similarly, no reasonable expectation of success of X-ray examining structures of a semiconductor substrate, as claimed in independent Claim 1, could possibly be found in Iketaki alone or in combination with another publication.

Sartore teaches defect detection and thickness mapping of passivation layers on integrated circuits using energy dispersive X-ray analysis and image processing techniques. However Sartore does not teach or suggest X-ray radiation penetrating the substrate, as claimed in independent Claim 1; it teaches only using X-ray radiation scattered off the circuit without passing through it. No reasonable expectation of success of X-ray examining structures using transmission of the X-radiation through the substrate, as claimed in independent Claim 1, could be possibly found in Sartore alone or in combination with another publication.

Neither Thieme nor Levine et al. teaches or suggests X-ray radiation penetrating structures on a semiconductor substrate, as claimed in independent Claim 1. In fact, Levine et al. explicitly teaches the opposite, i.e. removing the silicone substrate to study

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the structures (page 150, col. 2, lines 4-10). No reasonable expectation of success of X-ray examining structures using transmission of the X-radiation through the substrate, as claimed in independent Claim 1, could be possibly found in either Thieme or Levine alone or in combination with another publication.

With regard to independent Claim 12, Applicants respectfully assert that none of the references alone or combined teaches or suggests using transmission of X-ray radiation through a semiconductor substrate to observe changes in distribution of a material of the passivated structures of integrated circuits corresponding to a change of contrast of the high contrast image. The arguments presented in support of patentability of independent Claim 1 are herein repeated in their entirety. Independent Claim 12 is therefore allowable.

Claims 2-11 depend off independent Claim 1 and are allowable for the same reasons as presented above. Claims 13-15 depend off independent Claim 12 and is allowable for the same reasons. Further, if an independent claim cannot be rejected under 35 U.S.C. §103(a), then any claim depending therefrom cannot be rejected under 35 U.S.C. §103(a). Allowance of the Claims is respectfully requested.

CONCLUSION

The Examiner is kindly invited to telephone the undersigned to resolve any questions to expedite the allowance of the pending Claims.

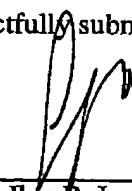
Applicants believe that the present application is in condition for allowance. A Notice of Allowance is respectfully solicited. Should any questions arise, the Examiner is encouraged to contact the undersigned.

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Respectfully submitted,

By



Ilya R. Lapshin, Reg. No. 54,251
Customer No. 29127
Houston Eliseeva LLP
4 Militia Drive, Suite 4
Lexington, MA 02421
Tel: (781) 863-9991
Fax: (781) 863-9931

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